

FILE WRAPPER FOR PROVISIONAL U.S. APPLICATION

NO: **60/119,210**

INVENTORS: GREGORY A. STOBBS
JOHN V. BIERNACKI

FILING DATE: FEBRUARY 5, 1999

TITLE: COMPUTER-IMPLEMENTED PATENT PORTFOLIO ANALYSIS
METHOD AND APPARATUS

*RELATED U.S. APPLICATION DATA:

USSN 10/806,307 FILED MARCH 22, 2004
PENDING
PATENT APPLICATION PUBLICATION 2004/0181427 A1

USSN 09/499,238 FILED FEBRUARY 7, 2000
PENDING

US PROVISIONAL APPLICATION SERIAL NO. 60/119,210
FILED FEBRUARY 5, 1999 [Captioned File]

*The related U.S. application data is drawn from the USPTO's public website and is not to be construed as a complete family of applications. Complete family information is available from the USPTO under 37 CFR §1.14.

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| Content Description | Date |
|---|------------|
| 1. Application | 02-05-1999 |
| 2. Initial Exam Team nn | 02-12-1999 |
| 3. IFW Scan & PACR Auto Security Review | 02-22-1999 |
| 4. Application Dispatched from OIPE | 03-01-1999 |
| 5. Set Application Status | 09-21-2001 |

HARNESSE, DICKEY & PIERCE, P.L.C.

ATTORNEYS AND COUNSELORS
P O BOX 828
BLOOMFIELD HILLS, MICHIGAN 48303
U.S.A.

Date: February 5, 1999

TELEPHONE
(248) 641-1600

TELEFACSIMILE
(248) 641-0270

Hon. Commissioner of Patents and Trademarks
Washington, D.C. 20231
ATTN: Box Provisional Patent Application

Re: Title: Computer-Implemented Patent Portfolio Analysis
Method and Apparatus
Atty. Docket: None

Sir:

This is a request for filing a provisional patent application. Pursuant to 37 C.F.R. 1.51(c), the following information and documents are provided:

1. The names and addresses of the inventors:

First Inventor: Gregory A. Stobbs

Residence: 971 Charrington, Bloomfield Hills, Michigan 48301

Second Inventor: John V. Biernacki

Residence: 2912 Ravine Drive, Apt. #306, Lake Orion, Michigan 48360

2. A specification having 21 pages.
3. ☒ 1 sheet of drawings showing Figure 1.
4. ☐ This invention was made by an agency of the United States Government or under a contract with an agency of the United States Government under contract number _____.
5. ☒ A Verified Statement Claiming Small Entity Status is enclosed.
- 6a. ☒ A check is enclosed to cover the fees as calculated below. The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 08-0750. A duplicate copy of this document is enclosed.
- 6b. ☐ The fees calculated below will be paid within the time allotted for completion of the filing requirements.
- 6c. ☐ The fees calculated below are to be charged to Deposit Account No. 08-0750. The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to said Deposit Account. A duplicate copy of this document is enclosed.

Date: February 5, 1999

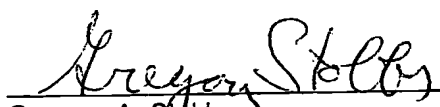
| | |
|---|-----------------|
| FILING FEE CALCULATION - BASIC FEE | \$150.00 |
| FILING FEE - NON-SMALL ENTITY | |
| FILING FEE - SMALL ENTITY: Reduction by 1/2 | \$75.00 |
| A Verified Statement is enclosed. | |
| Assignment Recordal Fee (\$40.00) | |
| TOTAL | \$75.00 |

7. ☐ An Assignment of the invention is enclosed. The required cover sheet under 37 C.F.R. §3.11, §3.28 and §3.41 is attached.
8. ☐ Because the enclosed application is in a non-English language, a verified English translation for examination purposes of same ☐ is enclosed ☐ will be filed within the allotted time period.
9. ☒ An Express Mailing Certificate is enclosed.
10. ☐ Other
11. Please direct all correspondence and telephone calls relative to this application to the undersigned at the following address:

HARNESS, DICKEY & PIERCE, P.L.C.
P. O. Box 828
Bloomfield Hills, Michigan 48303
(248) 641-1600

If, for some reason, Applicant(s) has/have not paid a sufficient fee, please charge our Deposit Account No. 08-0750 for any further fees which may be due or credit any overpayment to Deposit Account No. 08-0750. A duplicate copy of this document is enclosed.

Respectfully,



Gregory A. Stobbs
Reg. No. 28764

COMPUTER-IMPLEMENTED PATENT PORTFOLIO ANALYSIS METHOD AND
APPARATUS

Inventors:

Gregory A. Stobbs
971 Charrington
Bloomfield Hills, MI 48301
Citizenship: United States

John V. Biernacki
2912 Ravine Drive
Apt. #306
Lake Orion, MI 48360
Citizenship: United States

Background of the Invention

The present invention relates generally to a computer-implemented system for analyzing patents. More particularly, the present invention relates to a computer-implemented system for analyzing patents with linguistic and other computer techniques.

Description of the Preferred Embodiment

Figure 1 depicts a comprehensive computer-implemented patent portfolio analysis system. Linguistic analysis techniques are combined with other techniques in order to categorize and/or analyze a plurality of patents or patent applications. In order to achieve a higher quality of associating patents with proper categories, the preferred embodiment of the present invention utilizes a multi-tiered approach.

A linguistic analysis engine (1) produces clusters of patents which have been grouped according to linguistic similarity. Linguistic analysis engine may examine one or more of the following sections of a patent in order to determine which patents are similar based upon linguistic analysis: claims; abstract; summary; preferred embodiment;

and/or background of the invention. In the preferred embodiment, linguistic analysis engine examines the claims and abstracts of the patents.

Linguistic analysis engine uses one or more of the following types of linguistic engines: a word or words engine; a core word engine; and an eigenvector analysis engine. A word analysis engine examines whether patents have similar types of words in common. A word analysis engine preferably utilizes a thesaurus in order to more flexibly determine that a group of patents utilizes similar words. For example, but not limited to, a word analysis engine may have within its thesaurus as approximate synonyms the terms memory and storage.

Core word analysis engine produces clusters based upon predetermined patent sections containing similar word roots. For example, but not limited to, with a first patent containing the word "fastener" and a second patent containing the word "fasten", the core word analysis engine determines that these two words contain the same root word fasten and clusters the two patents based upon the two patents sharing a certain number of root words.

An eigenvector analysis engine produces clusters based upon an alternate technique. The alternate technique for forming coarse claim clusters employs a dimensionality reduction process that yields a plurality of eigenvectors that represent the claim space occupied by a plurality of patent claims that have already been labeled as belonging to a known cluster or category group. The technique works as follows.

A corpus of training claims is assembled to represent the entire claim with which the patent portfolio analyzer is intended to operate. The training claims can be selected from actual patents, or they may be drafted specifically for the training operation. Each claim in the training corpus may be labeled according to the user's preassigned cluster categories. Later, when the eigenvector system is used, uncategorized claims are projected in the eigenspace and associated with the closest training claim within the

eigenspace. In this way, the uncategorized claim may be assigned to the category of its closest categorized neighbor.

To construct the eigenspace we first form supervectors representing distinguishing features of a claim using a predefined format. The predefined format, itself, is not critical. Any suitable format maybe used provided that such format is used consistently for all claims in the training corpus and all claims later being categorized by eigenspace projection.

In one form, the supervector for each claim may consist of a one dimensional array of integer values, where each integer corresponds to one word in the claim. The array of integers may be indexed in the order that the words appear in the claim. Integer numbers may be assigned to words by first forming a dictionary of all words found in the training corpus, deleting any noise words (such as articles or short prepositions), alphabetizing the dictionary and then sequentially assigning integer numbers.

In this embodiment, a predefined maximum array size may be established, so that the supervectors for all claims will have the same number of array elements. Claims having fewer words than the maximum array size are handled by inserting a null character in each array element that does not contain a word integer. Claims that exceed the maximum array size are truncated at the maximum array size, using the final element of the array as a flag to indicate overflow. A suitable overflow character may be selected for this purpose.

Alternatively, a supervector may be constructed by defining a one dimensional array of size equal to the number of words in the claim language dictionary. The array is then populated by integer numbers indicating the number of times each word appears in the claim. This will, of course, result in an array that is populated by many zeroes as most claims do not use all words in the claim dictionary.

The above two alternative supervector configurations produce fairly large structures. However, these large structures are reduced in forming the eigenspace to a set of eigenvectors equal in number to the number of claims used in the training corpus. Although this dimensionality reduction step is computationally expensive, it only needs to be performed once to define the eigenspace.

A third alternate embodiment employs a supervector that is based on a preprocessing step whereby each claim is reduced to its component parts of speech using a natural language parser. The resulting tree structure may then be parameterized and stored as elements of the supervector, along with the respective word integers occupying each node of the tree. In effect, parsing the claim produces something similar to a grammatical sentence diagram in which the relationships and grammatical function of sentence fragments and phrases are revealed.

After supervectors have been generated for each of the training claims, a suitable dimensionality reduction process is performed on the supervectors. Principal component analysis is one such dimensionality reduction process. There are others. Dimensionality reduction results in a set of eigenvectors, equal in number to the number of claims in the training corpus. These eigenvectors define an eigenspace that represents the claim scope occupied by the elective members of the training corpus. The eigenspace is an n -dimensional space (n being the number of claims in the training corpus). Each of the n dimensions is defined by the dimensionality reduction process (e.g. principle component analysis) to maximally distinguish claims from each other.

After the eigenspace has been constructed, each claim in the training corpus may be projected into that space by performing the same dimensionality reduction process upon the supervector for that one claim. This places each claim as a point within the n -dimensional eigenspace. Each point may be labeled with its corresponding cluster or category designation. Thus regions within eigenspace near a given labeled

point represent subject matter that is likely to be similar to the subject matter of the claim that defined the given point.

After the eigenspace is constructed and all known points have been placed into that space and labeled, the system may be used to analyze uncategorized claims. This is done using the same procedure that was used to place categorized claim into the eigenspace. Thus the uncategorized claim is processed to generate its supervector and that supervector is dimensionality reduced (e.g. through principle component analysis) and placed into the eigenspace. Next, a searching algorithm explores each of the labeled points in close proximity to the newly placed point to determine which is the closest. A geometric distance (in the n-dimensional space) may be used to determine proximity. If the newly projected claim is within a predefined proximity of the closed training claim point, it may be assigned to the cluster or category of the training claim. If the newly projected point is outside a predefined threshold from its closest neighbor, suggesting that the new claim is not all that similar to the existing claims, then the new claim is not assigned to the closest neighbors category. Rather, the new point is treated as a new cluster within the eigenspace. After the system has been used for a while, the user may manually examine the content of new clusters, giving them labels that may be subsequently used for further claim processing.

Linguistic analysis engine produces coarse patent clusters based upon utilizing one or more of the aforementioned engines. Moreover, the term coarse in "coarse" patent clusters is utilized within the present invention to designate that the patent clusters produced from linguistic analysis engine is subsequently refined by subsequent processes according to the teachings of the present invention.

Linguistic analysis engine can in an alternate embodiment use not only the aforementioned linguistic engines but also separately or in concert with the aforementioned linguistic engines a claim meaning analysis engine (2). A claim

meaning analysis engine examines one or more claims of a patent in order to determine the meaning or semantics of the claim. For example, but not limited to, claim meaning analysis engine examines the words contained within a "wherein" or "whereby" claim clause in order to partially or wholly determine the meaning or gist of a claim. Moreover, a claim's preamble can be examined to determine claim meaning, as well as using claim element position to determine claim meaning since typically claim elements which appear later in a claim contain the more important components. Also, if file history data is available electronically, then responses to office actions can be examined to determine what claim limitations were most important in order to make a patent distinguishable over the prior art. Claim meaning analysis engine can use one or more of these aspects (e.g., wherein analysis, preamble analysis, etc.) in order to best determine the meaning of a claim. Each of these aspects can be weighted to make one aspect more predominant in determining the meaning of a claim.

Claim meaning analysis engine can utilize a linguistic tagger software in order to identify parts of speech in a claim such as identifying a "wherein" or a "whereby" clause as well as relative purpose clauses (which clauses can be used to determine a chief purpose for one or more elements of a claim). One linguistic tagger software package is obtainable from such sources, but not limited to, the Xtag software package from the University of Pennsylvania.

Moreover, an expert system can be used alone or in concert with linguistic tagger software in order to determine the meaning of a claim. The expert system includes claim meaning expert rules in order to identify the meaning of the claim. For example, a claim meaning expert rule includes a larger weighting factor being applied to a phrase which is: part of a wherein clause and the wherein clause appears in the last portion of the claim.

Another exemplary non-limiting claim meaning expert rule is where a claim element utilizes similar words to the words which appear in a claim's preamble. The expert system would more heavily weight such a claim element since a claim element which discusses the goal of the preamble is more likely to be an important element.

Claim meaning analysis engine also includes in an alternate embodiment a neural network being utilized either alone or in concert with linguistic tagger software and/or expert system in order to determine meaning of a claim. The neural network is preferably a multi-tiered neural network with hidden layers whose weights have been adjusted due to training. Training includes processing a predetermined number of patent claims and/or patent abstracts through a multi-tiered hidden layer neural network and adjusting the weights based upon how well the neural network has determined the meaning of the claim.

Claim meaning analysis engine provides the meaning of each claim of a patent to linguistic analysis engine so that linguistic analysis engine can use one or more of its engines to produce coarse patent clusters. Moreover, in still another alternate embodiment of the present invention, claim meaning analysis engine produces its own coarse patent clusters based upon which patent claims have similar meanings.

The preferred embodiment of the present invention includes a patent classification engine (3). Patent classification engine is utilized by the present invention preferably in combination with linguistic analysis engine and claim meaning analysis engine in order to determine with high fidelity which patents belong in the same cluster. Patent classification engine examines the United States Patent classification of a patent relative to the classification of another patent or relative to a predetermined classification in order to determine whether the first patent should be placed in the same cluster as another patent. Patent classification engine examines this relationship by determining the degree of relatedness between two United States patent classifications. For

example, a cluster of patents will be obtained for those patents which are only five "class steps" away from each or from a predetermined classification. Within the present invention, the term class step refers to the tree-like structure of the United States patent classification wherein a parent-child relationship within such a classification system would constitute one class step.

In an alternate embodiment, the search notes produced by the United States Patent Office are used to determine which classifications relate to one another.

A refined cluster generator (4) produces refined patent clusters based upon the coarse patent clusters which are available from one or more of the aforementioned engines. Refined cluster generator produces refined patent clusters based upon a relationship among the linguistic clusters, the clusters from the classification degree of relatedness, and clusters from the patent claim meaning engine. Refined cluster generator utilizes in the preferred embodiment a factor approach wherein different weights are attributed to each of these different types of clusters. For example, linguistic clusters may be weighted with a higher factor value than a cluster from the patent claim meaning engine. These factor values allow clusters from different types of engines to be utilized according to how well the engine can cluster for the application at hand.

Moreover, the present invention in the preferred embodiment utilizes factor values within the clusters from the linguistic analysis engine. For example, linguistic analysis engine produces a score for each patent on how well a patent fits within a particular cluster. A factor value is preferably used to indicate how well that patent fits within a linguistic cluster. An exemplary factor approach includes a factor value of 1 being given to a patent whose cluster score indicates an excellent fit within the cluster. A factor value of 0.75 is associated with a patent with only a good cluster score. A factor value of 0.5 is associated with the patent which has only an average cluster score. A

factor value of 0.25 is associated with a patent with a below average cluster score and a factor value of 0 is associated with a patent whose cluster score is extremely poor.

Refined cluster generator is able to produce a more refined patent cluster than any of the engines since refined cluster generator produces clusters based upon more information than is available to any one engine. Refined cluster generator provides the refined patent clusters to patent category engine (5).

Patent category engine (5) associates each refined patent cluster with a category. A category may already exist, for example, through a client previously providing certain categories. The present invention also includes dynamically determining the categories, for example, by using the United States patent classification titles which are found for each patent within a particular cluster. Moreover, categories may be dynamically determined by examining the key core words or key words associated with a cluster produced from linguistic analysis engine and/or claim meaning analysis engine.

In an alternate embodiment, both predetermined categories and dynamically determined categories are utilized since the predetermined categories may not address all of the clusters.

Patent portfolio analysis engine (6) receives the categorized refined patent clusters from patent category engine. Patent portfolio analysis engine examines the patents in each cluster by determining, for example, how one assignee's patents have clustered in each category with respect to a second assignee's patents. In the preferred embodiment, patent portfolio analysis engine includes a patent portfolio comparison analysis engine in order to perform that function.

Patent portfolio analysis engine preferably includes a claim breadth analysis engine in order to analyze the breadth of each patent claim. Claim breadth is important for example, for determining which patents are the broadest and hence more likely to be

infringed. Claim breadth analysis engine in one embodiment examines the number of words of a claim in order to provide an indication of how broad a claim is. In the preferred embodiment, an adjusted claim length is utilized wherein the number of words in a claim's preamble is accorded less weight. Preferably, claim breadth analysis engine reduces the total number of words in a claim by half of the number of words in a claim's preamble.

Claim breadth analysis engine in an alternate embodiment includes clusters which in a Cartesian graphical format represent clusters with a centerpoint and a varying or non-varying radius about that centerpoint which represents the cluster's patents which are the furthest distance on a linguistic basis from the cluster's center point. The present invention examines the average length of the cluster based upon this Cartesian representation in order to determine claim breadth. Both the average length of the cluster and the adjusted word count are utilized in the preferred embodiment to determine which claims are the broadest.

Moreover, a database of patents (7) is provided which has United States patent information and foreign (e.g., PCT) patent and foreign (e.g., PCT) patent application information. The database of patents is utilized to identify which patents are the most "important" since there is a relationship between importance of a patent and in how many countries a patent has been filed.

In an alternate embodiment of the present invention, patent portfolio analysis engine is utilized without the clustering technique and is utilized primarily only through the database of patents. This alternate embodiment is utilized typically when patent portfolio analysis is performed without clustering. This may be done when only claim breadth analysis without categorization is satisfactory for the application at hand.

A filter is used in order to reduce the number of "noise" patents which are identified as the result of key word patent searching. The filter identifies high fidelity and

low fidelity patents by constructing high fidelity search strings to obtain high fidelity patents and place them into one portion of the patent database. A lower fidelity search strategy is run to obtain lower fidelity patents and place them into a separate portion of the database. The lower fidelity patents then can be examined on a more individual basis within the database to determine whether the patents belong in the patent portfolio analysis.

For example, a high fidelity search string includes United States patent classifications whose patents are probably all high fidelity. Moreover, a high fidelity search string may include an assignee where it is already known that all patents of that assignee are highly relevant. As shown on Figure 1, the engines which produce the coarse patent clusters use as input the filtered patents from the filter. However, it is to be understood that the present invention also includes not providing filtered patents to the engines. For example, the engines can examine the entire universe of patents or the engines can examine the patents of particular assignees.

Using the information from patent category engine and from the database of patents, patent portfolio engine produces in the preferred embodiment the following types of reports: claim breadth analysis reports; patent portfolio comparison reports; and patent clearance reports. Claim breadth analysis reports indicate such items as the client's broadest claims which may be the best candidates for which patents a competitor is most likely to infringe. Also this report can indicate the client's longest (i.e. narrowest) claims which are probably the best candidates to discontinue to pay maintenance fee payments. Moreover, claim breadth analysis reports may indicate the competitor's shortest claims which may be the best candidates for which patents the client is most likely to infringe.

Patent portfolio comparison reports include a comparison of the number of client's and competitor's patents for each category on: a raw total number basis; and a

difference number basis. Also this report includes a time trend analysis whereby for each year in a predetermined time interval the number of patents of a client and of a competitor is examined for each category.

Patent clearance reports assist a patent attorney in a freedom-to-practice study since patent clearance reports obtain relevant patents for the study which have been processed by the filter and which are sorted by United States patent classification so that the patent attorney can more quickly examine the claims of each of the relevant patents. Moreover, patent clearance reports can be sorted by claim breadth so that the shortest claims (which are more likely to be broader) are examined first.

Example

A core word linguistic software engine grouped patents into clusters based upon patent claims and abstracts. However, it should be understood that the present invention is not limited to only clustering on patent claims or patent abstracts but can cluster on any part of the patent. Moreover, two different clustering approaches were used. The first approach was to have patents assigned to one or more clusters. The second approach assigned patents to the one cluster with which the patent was most strongly associated.

The core word linguistic software engine produced two files: a clustered patents file and a core word keywords cluster file. A clustered patents file contained: cluster number, cluster score patent number, assignee, patent title. Patents are clustered based upon claim or abstract text. The table below shows an example of a clustered patent file.

| Cluster Number | Cluster Score | Patent Number | Assignee | Patent Title |
|----------------|---------------|---------------|------------|---|
| 1 | 16.3 | 5122976 | Assignee A | Method and apparatus for remotely controlling sensor processing algorithms to expert sensor diagnoses |
| 1 | 37.8 | 5107497 | Assignee B | Technique for producing an expert system for system fault diagnosis |

A second file contains core word keywords cluster file. The cluster's keywords are used to categorize each cluster. The fields of the second file preferably include: cluster number and key words. The table below shows an example of core word keywords in a cluster file.

| Cluster Number | Keywords |
|----------------|--|
| 1 | exper diagn compute store faul fail syst data address receive share retrieve |

An initial set of categories is generated for each cluster. Since many clusters may be generated by the linguistic analysis engine, more general categories are preferably established to more easily analyze and portray the patent portfolio results. In the preferred embodiment, the linguistic analysis engine is able to vary the number of clusters for a group of patents. The resulting cluster-to-category mapping can be a many to one relationship since several clusters may be mapped to one category. For example, clusters 1, 8, 110 and 133 may all be mapped to a general category of "(A) Computer Heuristic Algorithms". Moreover, if a large number of clusters exist, then preferably the categories may be arranged in an hierarchy so that an user can select what level of detail is most fitting for the application at hand. For example, a general category of "(A) Computer Heuristic Algorithms" decompose into other categories of "(A.1) fuzzy logic", "(A.2) neural networks", etc. If needed, these categories may in turn decompose into still more detailed categories.

An inheritance principle exists between a parent and child category in that cluster numbers, factor values, and patent counts of a child category are automatically inherited for a parent category. For example, parent category B may have children categories B.1 and B.2. Child category B.1 has five patents with a particular factor breakdown and child category B.2 has seven patents with a particular factor breakdown. Parent category B would include the twelve patents with the cluster numbers and factor values of its children as well as any patents, cluster numbers, and factor values which parent category B itself has.

Since Patents have been assigned to each cluster, the titles and the United States Patent Office Classification titles for the Patents are used to categorize a cluster. Accordingly, an initial set of categories is developed based upon a brief review of the patents (usually the patent titles and the U.S. Patent Office Classification titles) and the cluster's keywords.

It should be understood that the present invention includes a patent being placed in one or more clusters depending upon the linguistic algorithm used. For example, an expert system patent used to detect failures may be placed in both of the following clusters: a cluster which is directed to expert systems in general; and a cluster which includes computer-related approaches for detecting failures (whether they be expert system approaches or another failure detection approach, such as through a threshold detection approach or through a neural network approach).

Below are two clusters and how they were assigned to categories:

| Cluster Num | Key Terms | Category |
|-------------|--|----------------------|
| 1 | exper diagn compute store faul fail syst data address receive share retrieve | (A.1) Fuzzy Logic |
| 8 | neur diagn netw compute weig store faul fail syst data address nod share retrieve | (A.2) Neural Network |

A factor value is determined which indicates how well a patent fits within a cluster. Each Patent has a "cluster score" which indicates how strongly did a patent fit within the keywords of a cluster. For example, patent 5,122,976 has a cluster score of 16.3 for Cluster #1. Patent 5,107,497 has a cluster score of 37.8 for Cluster #1. The higher cluster score indicates that patent 5,107,497 "fits" better with the keywords of Cluster #1 than the first Patent.

A factor value is utilized to indicate the fact that the second patent fits more closely with the keywords of Cluster #1 than the first patent. The following factor values are used:

| Cluster Score | Factor Value |
|-------------------------------------|--------------|
| Cluster Score ≥ 30 | 1 |
| $20 \leq \text{Cluster Score} < 30$ | .75 |
| $10 \leq \text{Cluster Score} < 20$ | .5 |
| $0 < \text{Cluster Score} < 10$ | .25 |
| Cluster Score = 0 | 0 |

Each patent in each cluster is associated with the appropriate factor value based upon its cluster score.

If it is desired to determine how many patents an assignee has in each category, then the factor values are summed for each assignee in each category. The following table shows an example of a factor value breakdown of cluster number 1 for each Assignee for category A.1 (note that the other cluster numbers are omitted below for easier viewing of the table):

| Category Number | Category Name | Current Assignee | Factor | Cluster Number | Cluster Score |
|-----------------|---------------|------------------|--------|----------------|---------------|
| A.1 | Fuzzy Logic | Assignee A | 0.5 | 1 | 15 |
| A.1 | Fuzzy Logic | Assignee B | 1 | 1 | 37 |
| A.1 | Fuzzy Logic | Assignee B | 1 | 1 | 30 |
| A.1 | Fuzzy Logic | Assignee B | 1 | 1 | 37 |
| A.1 | Fuzzy Logic | Assignee B | 0.75 | 1 | 28 |
| A.1 | Fuzzy Logic | Assignee B | 0.75 | 1 | 25 |

| | | | | | |
|-----|-------------|------------|------|---|-----|
| A.1 | Fuzzy Logic | Assignee B | 1 | 1 | .33 |
| A.1 | Fuzzy Logic | Assignee B | 0.75 | 1 | 26 |
| A.1 | Fuzzy Logic | Assignee B | 1 | 1 | 32 |

The factor sum for Assignee A for Cluster #1 (which is assigned with other Clusters to Category A.1) = 0.5. The factor sum for Assignee B for Cluster #1 (which is assigned with other Clusters to Category A.1) is 7.25.

| Category Number | Category | Assignee | Sum Of Factor Values |
|-----------------|-------------|------------|----------------------|
| A.1 | Fuzzy Logic | Assignee A | 18.75 |
| A.1 | Fuzzy Logic | Assignee B | 26.5 |

independent of cluster number:

The following table shows the sum of the factor values for each assignee

"Fuzzy Logic" is 26.5.

Logic" is 18.75. The factor sum for Assignee B for all clusters assigned to category A.1

The factor sum for Assignee A for all clusters assigned to category A.1 "Fuzzy

| Category Number | Category | Assignee | Count Of | Sum Of | Cluster Score | Sum |
|-----------------|-------------|------------|----------|--------|---------------|-----|
| A.1 | Fuzzy Logic | Assignee B | 8 | 7.25 | 31.00 | 1 |
| A.1 | Fuzzy Logic | Assignee B | 2 | 2 | 56.00 | 45 |
| A.1 | Fuzzy Logic | Assignee B | 6 | 4.75 | 31.17 | 58 |
| A.1 | Fuzzy Logic | Assignee B | 3 | 2.75 | 35.67 | 59 |
| A.1 | Fuzzy Logic | Assignee B | 1 | 1 | 46.00 | 77 |
| A.1 | Fuzzy Logic | Assignee B | 3 | 2.75 | 31.67 | 109 |
| A.1 | Fuzzy Logic | Assignee B | 1 | 0.75 | 22.00 | 128 |
| A.1 | Fuzzy Logic | Assignee B | 2 | 1.25 | 19.50 | 132 |
| A.1 | Fuzzy Logic | Assignee B | 2 | 1.5 | 29.00 | 138 |
| A.1 | Fuzzy Logic | Assignee B | 3 | 2.5 | 32.67 | 139 |
| A.1 | Fuzzy Logic | Assignee A | 1 | 0.5 | 15.00 | 1 |
| A.1 | Fuzzy Logic | Assignee A | 3 | 2.25 | 23.67 | 37 |
| A.1 | Fuzzy Logic | Assignee A | 1 | 1 | 34.00 | 58 |
| A.1 | Fuzzy Logic | Assignee A | 1 | 0.75 | 25.00 | 59 |
| A.1 | Fuzzy Logic | Assignee A | 3 | 2.75 | 48.00 | 77 |
| A.1 | Fuzzy Logic | Assignee A | 3 | 3 | 36.67 | 103 |
| A.1 | Fuzzy Logic | Assignee A | 6 | 5 | 28.67 | 128 |
| A.1 | Fuzzy Logic | Assignee A | 2 | 1.75 | 28.50 | 132 |
| A.1 | Fuzzy Logic | Assignee A | 2 | 1.75 | 35.50 | 138 |
| A.1 | Fuzzy Logic | Assignee A | 2 | 1.75 | | |

sums:

The following table shows the other clusters for category A.1 and their factor

The present invention can graph the results which were obtained using the "Factor Approach". The Summed Factor Values for each Assignee and for each Category are graphed side-by-side. The 18.75 value indicates that Assignee A has approximately 19 Fuzzy Logic Patents while Assignee B has approximately 27 Fuzzy Logic Patents.

Also, the "difference" between the Assignees' Factor Values were determined and graphed. For example, the difference between the Assignees' Factor Values for the "Fuzzy Logic" Category was "18.75-26.5" or "-7.75". The -7.75 value indicates that Assignee B has approximately 8 more Fuzzy Logic patents than Assignee A. Through use of the present invention, the relative patent portfolio metric produces a more accurate assessment of how Assignee A stands with respect to other assignees. This may be due to any biases which enter into the algorithm on an absolute basis being cancelled when a relative comparison (or delta) is performed among the assignees' portfolios.

It is to be understood that the present invention is not limited to only examining two assignees, but includes comparing more than two assignees' patent portfolios. Moreover, it is to be understood that the present invention examines patents independent of assignee.

Bar graphs are produced that depict how many patents each Assignee has per category. Also, bar graphs are produced that depict the difference in the number of patents between two assignees for each category.

The present invention can also graph the results not using the "Factor Approach". The number of patents that each Assignee had within each Category can be graphed. Moreover, the "difference" between the Assignees' number of patents for a particular category can be graphed.

The graphs can also show a time trend. The number of patents per category per assignee can be graphed on a yearly basis to indicate the growth status for the number of patents of a particular assignee.

The present invention can also depict the breadth of a claim by a claim breadth number. The claim breadth number for each independent claim is determined based upon the number of words that a claim contained. Since the preamble typically contains fewer restrictions upon a claim's breadth, the claim breadth number was reduced by the half the number of words within the preamble.

For example, Assignee A's Patent 5,122,976 (entitled "Method and apparatus for remotely controlling sensor processing algorithms to expert sensor diagnoses") had a claim breadth number of "39" for its Claim 1 and an adjusted claim breadth number of "37" (since the rounded up value of "three words divided by two" yielded a value of two):

| Patent No. | Claim Text | Unadjusted Breadth No. | Adjusted Breadth No. |
|------------|--|------------------------|----------------------|
| 5122976 | 1. An apparatus, comprising: control means for sampling sensor data and performing sensor data processing; and diagnostic means for diagnosing a sensor malfunction using the sensor data, and said control means performing the sensor data processing responsive to the diagnosis. | 39 | 37 |
| 5107497 | 1. A method of forming a knowledge base in a computer for producing an expert system for diagnosing a predetermined arrangement of a system to determine if the system contains a fault, said system comprising a plurality of components having respective predetermined failure rates. the method comprising the steps of: (a) decomposing the system into groups of sequential and parallel subsystems, each of said subsystems comprising at least one of said components; (b) generating a tree structure of the groups of step (a) by attaching nodes to each parallel and sequential link between subsystems in the tree to provide a tree configuration of sets of components suspected of being faulty and possible choice measurement sets; (c) computing a lower bound cost of a sequence of tests for each of the parallel and sequential subsystems using a first rule that (1) if a node is a parallel node, then the lower bound cost for that node is computed by (i) sorting numerically and in a first predetermined order a first list P of the failure rates of the components of each subsystem, (ii) sorting numerically and in a second predetermined order a second list L of test costs of the components of each subsystem, and (iii) for corresponding elements in lists P and L, computing a product of each of the corresponding elements, and (2) a second rule that if the node is a sequential node, then the lower bound cost of the sequence of test cases for that node is computed by (i) separately sorting numerically and in a predetermined order each of the failure rate and the test cost for each component of each subsystem in the first and second lists P and L, respectively, (ii) initializing a variable h to zero, (iii) selecting the lowest valued two numbers p.sub.1 and p.sub.2 from the list P, (iv) computing a current value for a failure rate p by | 402 | 377 |

| | | |
|--|--|--|
| summing p.sub.1 and p.sub.2 (v) selecting a first member c from list L, (vi) summing the current value of h with the product of the value of p.sub.1 and p.sub.2 from step (iv), and placing such sum for the current value for h, (vii) inserting the current value of p in numerical order in list P, and (viii) repeating steps (iii) to (vii) until p=1; and (d) generating a diagnostic knowledge base for generating a diagnostic fault testing sequence at an output of the computer. | | |
|--|--|--|

Patent 5,107,497 on the other hand has a relatively high Adjusted Claim Breadth number, and if, for example, the purpose of the patent portfolio analysis is to determine which patents of the client are candidates for not maintaining through payment of maintenance fees, then this patent is a likely candidate due to its tendency to be too narrow to provide adequate protection for the client.

The preferred embodiment counts the words in a claim by counting the blank spaces (that is ASCII code 32) in the claim. This approach helps accelerate processing since the database may include hundreds of thousands of claims. The preferred approach also only examines the claim breadth of independent claims.

While the invention has been described in its presently preferred embodiments, it will be understood that the invention is capable of certain modification without departing from the spirit of the invention.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Group Art Unit: Unassigned
Examiner: Unassigned
Inventors: Gregory A. Stobbs and John V. Biernacki
Serial Number: Unassigned
Filed: Concurrently herewith
For: COMPUTER-IMPLEMENTED PATENT PORTFOLIO ANALYSIS
METHOD AND APPARATUS

Patent No.
Issued: Unassigned

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) AND 1.27(b)) - INDEPENDENT INVENTOR

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention described in

- ☒ the specification filed herewith.
☐ the application whose serial number is set forth above.
☐ the patent set forth above.

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not likewise be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Signature Gregory A. Stobbs
(Typed Name) Gregory A. Stobbs

Date Feb 5, 1999

Signature John V. Biernacki
(Typed Name) John V. Biernacki

Date February 5, 1999

FIG. 1

